



# Usability testing and design of a library website: an iterative approach

Usability testing  
and design

Carole A. George

*Carnegie Mellon University Libraries, Pittsburgh, Pennsylvania, USA*

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## Abstract

**Purpose** – The purpose of this paper is to provide a case study of the usability studies used by the Carnegie Mellon University Libraries during the redesign of their website.

**Design/methodology/approach** – The Libraries used a web-based survey to determine needs, proceeding to the prototype design, and completing the process with the final design and user testing. Think-aloud protocols, used to determine the strengths and weaknesses of the final design, asked participants to verbalize their thoughts as they completed a series of tasks.

**Findings** – The results of the protocols indicated several key weaknesses with respect to navigation, screen design and labeling, leading to more revisions and the final release. Testing indicated that color and graphics attract attention; font, labels, and placement increase visibility; chunking and leading with keywords increase readability; and consistency increases usability.

**Research limitations/implications** – This is a case study and therefore not necessarily representative to the general population of library website design efforts.

**Practical implications** – This paper describes several methods of gathering feedback during website design or usability testing with an emphasis on think-aloud protocols.

**Originality/value** – The techniques used here may be useful to others who are approaching redesign and usability testing of their own sites and interested in creating a user-centered design.

**Keywords** Academic libraries, Worldwide web, Design, User interfaces, Tests and testing

**Paper type** Case study

## Introduction

The services provided by university libraries have extended well beyond those offered at an on-site facility. As the demand and consequently number of online journals, books, materials, services, collections and search options continues to increase, off-site use increases. The website has become a significant aspect of the libraries and the services they provide, with over 60 percent of students at Carnegie Mellon conducting their research in areas outside the library. The design, usability, and functionality of the website are critical if the Libraries are to continue providing essential services to their patrons in a timely and efficient manner. Responding to feedback from users and the Libraries' faculty/staff, the Carnegie Mellon University Libraries began an extensive redesign of their website, using a number of different methods in the process.

This effort, begun in 1999, is still in progress, although major changes have been completed. A range of measures and teams were used to design, evaluate and produce the current design. The first step was a needs assessment of the then current site using a web-based survey of users and seeking feedback that provided a basis for improving the site to meet the needs of the patrons. Next, a multidisciplinary team of students from the Human-Computer Interaction Institute (HCI) from Carnegie Mellon designed a student-centered prototype using an iterative research and evaluation process. Using



this prototype as its starting point, the Libraries' Web Development Committee, along with the Library Information Technology department and input from library employees, created the final redesign for the site. Each step of the design process was an iterative approach of user feedback, design, and redesign drawing on user testing and feedback to measure the value and usability of design changes. This paper summarizes these efforts with a focus on the user testing of the final design.

### **Needs assessment – web-based user survey**

Before proceeding with a redesign of the website, the Libraries conducted a needs assessment using a web-based survey. The 21-item survey, a paper and pencil design distributed in the Libraries and an electronic version available via the Libraries' website, was available to all Carnegie Mellon students, staff, and faculty. The survey of multiple choice and rating scales gathered feedback about navigation, visual elements, search options, databases, usability and functionality, with one open-ended item for suggestions and comments (see Appendix 1). Of the 367 eligible surveys, 90 percent were electronically entered.

#### *Results*

- Over 80 percent of responses were evenly represented by undergraduate students and graduate students, while faculty and staff represented the remainder. Nearly 80 percent accessed the website either daily (24 percent) or weekly (54 percent) using Internet Explorer or Netscape (99 percent).
- Most (82 percent) reported using the reference materials either often or very often, with library services accessed second (56 percent).
- Information was reported as above average in usefulness and supportive of research. Links to outside information were good.
- Most (80 percent) rated the vocabulary as above average, though some indicated that labeling was unclear. Only 40 percent rated visual appeal above average, with responses indicating that the front page would benefit from a simple, clear, uncluttered design in addition to better organization of links.
- Infrequent users might have some difficulty finding information and determining "where I have been and where I can go". Some indicated getting "stuck in a loop".
- Responses indicated a desire for an option to customize the site and improve functionality of Cameo (the library's online catalog), the organization of links, navigation, and searching the databases.

#### *Design indications*

- Focus on a simple uncluttered design; reorganization of links focusing on the reference areas; re-label for consistency and clarity; use color, fonts and positioning for emphasis.
- Re-categorize the links, create a global navigation system for a cohesive look and to provide a consistent exit from page, provide a site map and search the site option, provide librarian e-help throughout the site and improve functionality.
- Improve functionality of Cameo, provide a guide to using the databases and using the libraries' other references resources.

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Based on the results of the online survey, the Libraries proceeded with a redesign of their website and, with the help of the Computer Science department, created a prototype design.

### Prototype design and user testing

The design of the prototype was a collaborative effort between the University Libraries and the Human-Computer Interaction (HCI) Institute. An interdisciplinary team of five students in the final year of study led the project (Anderson *et al.*, 2001). The goal was to create a user-centered interface, enhance usability, and expand resources of the Libraries' website.

The prototype development consisted of three design phases:

- (1) *ideation* – creating a plan based on the client's resources and analysis and evaluation of options;
- (2) *architecture* – designing the technology, developing plans for building the elements, and systematically testing for usability; and
- (3) *iteration* – building and testing the systems and processes while acquiring feedback from users.

Using heuristic examination, interviews with students and librarians, and think-aloud protocols, the team's initial findings and basis for the design included:

- over 60 percent of students reported using the library resources outside of the library;
- many students had difficulty navigating the website due to disorganized categorization: lists were sometimes unrelated items thus contributing to the confusion;
- many reported that the labels used on the front page didn't make sense: only 40 percent of students could correctly identify all 50 links with the content they provided; and
- students were not familiar with the extent of information on the libraries' website and indicated a need for easily accessible help.

The team focused on re-labeling and categorization, persistent navigation using global headers and footers, site consistency personalized to meet student needs, a clutter-free home page that used buckets, blocks of information in a right sidebar used for short bits of supplemental and sometimes short-term information such as features and news, and a global template that could be used on interior pages. To compensate for a lack of face-to-face communication with librarians, the team strove for clarity, efficiency, and easy access to electronic help. They conducted three iterations using think-aloud protocols to gather feedback and tested several different navigation bars, organizational links, etc. to create the final prototype design.

### Final design – think-aloud protocols

Findings of the web survey supported the findings of the HCI team's research: both asked similar questions in a different way. The questionnaires surveyed a large group of users while the HCI team asked similar questions in a series of interviews and think-aloud protocols. Both indicated a redesign of the home page with an emphasis on

the most used areas, re-labeling and reorganizing the links, and creating a simpler, less cluttered look. Using the HCI prototype as a starting point, the libraries created the website design. This final design was tested before final release using think-aloud protocols described in this section.

### *Procedure*

Think-aloud protocols were used to evaluate the functionality, usability, strengths, and weaknesses of the site and to make recommendations for revisions, if necessary, based on the feedback. Each session, approximately 30-45 minutes, was audio-taped with the consent of the participant. After piloting the tasks and making revisions, the live site was tested with representatives of the user community.

Nine participants were self-selected from a group who completed the Libraries' web survey and who expressed an interest in participating in further user testing. They included three males and four females; four undergraduate students, three graduate students, one staff member, and one faculty member. Computer expertise varied from average (2), good (3), to very good (4). Four had a non-English first language. Major study areas or departments included Arts (2), Business (2), Engineering and Sciences (4), and Humanities (1).

Using a live prototype of the redesigned website, participants were asked to verbalize their thoughts as they completed a series of tasks as directed by the researcher (see Appendix 2). Thinking aloud provided a mental model of the participant's use of the prototype and allowed a better understanding of how the prototype functioned (Nielsen, 1994). Early works in think-aloud protocols, most often attributed to K. Anders Ericsson and Herbert Simon (Ericsson and Simon, 1984), suggest a connection between thinking and verbal reports – thinking aloud. Verbalizing thoughts while completing tasks eliminates the need to rely on long-term memory that is necessary when asked to explain behavior after the task has been completed, thus providing a more accurate account of behavior (Ericsson, 2002).

The tasks were evaluated based using a rating scale developed by Jakob Nielsen that considers three factors:

- (1) the frequency with which the problem occurs;
- (2) how difficult is it for the users to overcome; and
- (3) the persistence of the problem, i.e. whether it is a one-time problem or frequent occurrence (Nielsen, n.d.).

The researcher provided help only when the participant reached a roadblock and testing for the specific task was halted. The tasks continued through the website. The rating scale was as follows:

- 0 = I don't agree that this is a usability problem at all;
- 1 = cosmetic problem only: need not be fixed unless extra time is available on project;
- 2 = minor usability problem: fixing this should be given low priority;
- 3 = major usability problem: important to fix, so should be given high priority; and
- 4 = usability catastrophe: imperative to fix this before product can be released.

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### *Visual display and screen design*

The first tasks evaluated the effect of the front-page objects by asking users to state what they saw first and identify the actionable links. Because reference to these tasks might affect the users' behavior on following tasks, only four participants completed the following tasks:

1. Describe the first item you notice on the page. What do you notice next? ( $n = 4$ , rating: 0).
2. Using the mouse, show which elements are actionable or clickable ( $n = 4$ , rating: 3).

### *Observations*

- Participants noticed objects with color (header) and images (photo) first and moved from left to right and top to bottom.
- They noticed the links as follows: all indicated the main sections, two indicated the header, all mentioned at least some of the links in the buckets, and two indicated the footer links. When searching for information, buckets and headers were often overlooked or searched last.
- All participants commented that they liked the design and thought it looked less cluttered and appeared user-friendly.

*Discussion and response.* Because the main navigational links were obvious to the user, no changes were made. The movement through the page suggests that important elements should appear in the main section. Color, graphics and placement can be used for emphasis while the buckets can be used for further and temporary information i.e. What's New, special collections, etc.

### *Cameo, the Libraries' catalog*

The first section of the home page titled "Search" included links to Cameo, to the databases, and to other library catalogs. These are important links to the Libraries' holdings, so it was important that all participants complete the tasks successfully. The following three tasks were used to test the links:

3. Find out if the library has the book *The Art of Digital Photography* by Tom Ang. Return to the home page (rating: 3).
12. Find the database NetLibrary. Return to the home page (rating: 0).
15. Using this Website site, log in to the University of Pittsburgh's library catalog? (rating: 3).

*Observations.* Though participants had no problems finding the database links, some had problems finding the link to the Libraries' catalog and the link to other library catalogs. A freshman and a junior who still had a great deal of trouble finding the Libraries' catalog had not used the catalog frequently and one was not proficient in English. Comments included:

I'm looking for a place to type in words.

I'm used to using a . . . search box. Sometimes I get impatient to look for something and to look for the link, and I just go to the search box and type in the word or whatever.

*Discussion and response.* Responses indicated a need to make the catalog more obvious to new and infrequent users. As shown Figures 1 and 2, the label in the prototype was “Cameo”, an unfamiliar word to new or infrequent users. The label was changed to more familiar terminology, the font was enlarged, color was used for emphasis and it was placed at the top of the home page as shown in the final version.

*Research Help*

Though less frequently used than the catalog and the databases, the “Research Help” links also are an important service and directly related to the research work of patrons. The “Research Help” section has two main divisions – the General/Reference Shelf and the subject-specific research help. The subject-specific pages have six classifications. All seven links in this section are treated with the same level of importance. The following tasks were used:

- 4. Find additional resources and help relating to a project you’re working on for an Architecture class without using the library’s catalog or the databases (rating: 2).
- 9. Find a page in the site for dictionaries, encyclopedias, etc. Return to the home page (rating: 2).

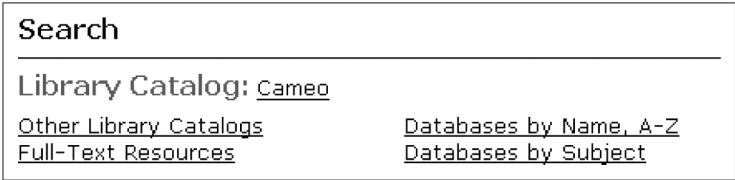
*Discussion and response.* Only minor problems were detected on these tasks: two participants had some trouble finding the research help by subject and two had minor problems finding the dictionaries, etc. located on the general reference pages. After this study another item, “ARF – Automated Resource Finder”, was added to the list. No revisions were necessary though because the list now includes eight links, the following suggestions might be considered for future redesign:

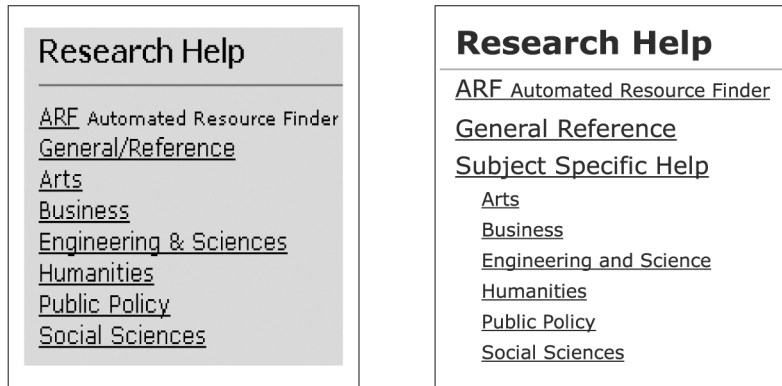
- To make scanning the list easier, create three main classifications (see Figure 3). This creates a visual separation between the main classifications and the subject-specific links.
- Using a smaller font for the subject areas links and indentation will help to differentiate them from the main classification areas. Both lists are more easily scanned.

Figure 1.  
Library’s catalog link:  
Cameo in prototype



Figure 2.  
Library’s catalog link:  
Cameo in final version





**Figure 3.**  
Research help: final  
version and suggested  
listing

### *User services*

The user services section includes links to information about the Libraries' services such as borrowing and renewing, interlibrary loan, and managing accounts. It also includes other services available to patrons such as managing accounts. The following tasks were used:

11. Check your account to find out about such things as overdue books, books on hold, or to the change pin? Return to the home page (rating: 3).
7. Show me what you would do if you would like to borrow a book that is held by another library and have it delivered to one of Carnegie Mellon's libraries. Return to the home page (rating: 0).

*Discussion and response.* Though participants had no problems finding the "Interlibrary Loan" links and successfully completing task 7, they did have problems finding the link to account information as described below:

- Three participants had problems locating the correct page for account information. Two went to the "Borrow and Renew" page but couldn't find the correct information located in the bucket. All three had to use the site map to eventually find the correct link.
- Three participants suggested that the "User Services" link that leads to account information should be directly accessible from the home page.

To address these problems, the "Borrow and Renew" page of the website was redesigned for clarity and readability. Important links are now in the main section, the first place users look, while supplemental links and information are in the buckets. The top of the page (see Figure 4) shows that the "Manage Your Library Account" link with descriptive information is the first link in the main section of the page, making it easily visible.

Chunking of information, displaying information in small bits, and leading with links enables a quick scan of the page while users search for appropriate help. For future redesign the Libraries might consider adding "Manage Your Library Account" link to the home page in the header or to the list of "User Services".

### *Buckets*

Buckets, blocks of information on the right sidebar, were designed to accommodate changing information, i.e. news, information sources. One task tested buckets on the front page, and the second tested the bucket information on the “Architecture” page, one of the subject specific research help pages. The following tasks were used:

5. Can you find help for the specific course titled “American Built Environment since 1860” with one click? Return to the home page (rating: 2).
8. Find a tutorial offered on the Website site. Return to the home page (rating: 2).

*Observations.* Minor usability problems were detected with these tasks. Participants examined the main section first and then continued to examine the page until they found the buckets. Once they found information in the buckets, they were more likely to continue to look at buckets on other pages. Some links were not obvious. One user, referring to the vertical line before the buckets, said:

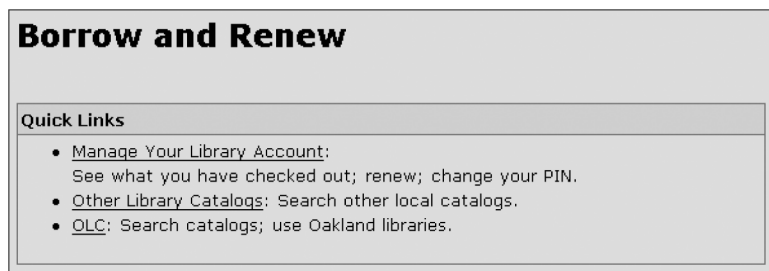
... this line really separated me from the right side of the page because I wasn’t looking at that at all.

Another commented:

This side [pointing to the main section] looks all neat and clean and this looks a little bit cluttered.

### *Discussion and response*

- The results indicated that important information or links need a permanent place in the main section on the front page or lower level pages. Buckets can be useful in featuring new items and contact information.
- The redesign (see Figure 5) strives to keep bucket information (text) minimal: begin with keywords and links, and use bold font or color to aid in scanning and increase visibility.
- The redesign strives for consistency in font color and size, bucket labels, placement of links (preferably at the beginning of the text), and simple design. Consistency throughout the site is not only visually pleasing, but decreases the learning curve.



**Figure 4.**  
“Borrow and Renew” in  
final version



**Figure 5.**  
Buckets in the final  
version

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### *Home page header*

Interestingly, when participants were asked what they noticed first, they mentioned the header, but when asked to find the link “Ask a Librarian”, which is located in the header, some had problems, though no-one had problems finding the site map, also in the header. The following tasks helped to point out these discrepancies.

6. Find online help to develop search terms from a librarian? Return to the home page (rating: 3).
13. Find an overview of what is included in the site. Return to the home page (rating: 0).

### *Observations*

- Links commonly included in headers (e.g. site map) posed no problems, though links like “Ask a Librarian”, which are unique to libraries, were difficult to find. Regarding the header links, one participant said: “It would be something to highlight ... they did blend in”.
- Another participant pointed out that the other links (Cameo, site map) were in other places in the site, while “Ask a Librarian” is only in the header.

*Discussion and response.* In the revision the links in the header that are unique to libraries, e.g. “Ask a Librarian”, were included in the header and also within the main section as a main or secondary link. The “Ask a Librarian” and “Cameo” link were also included under User Services. Under consideration for the next redesign are the following:

- to make header links more prominent and readable to visually impaired, use buttons that have a light font on a dark background or dark on light; and
- using an icon for “Ask a Librarian” or a search box for “Cameo” (library catalog) will add additional emphasis and draw attention to the links.

### *University Archives and full-text materials*

Though other research pages were linked from the home page in the category “Research Help”, the University Archives section and the full-text collections available

from this page were accessed from an interior page. Some services provided by University Archives were also be accessed through other pages. Both methods of access were tested to determine if they were sufficient. The following tasks were used:

10. The website has full-text collections of archival materials highlighting the achievements of notable individuals. Find the Herbert A. Simon Collection. Return to the home page (rating: 2).
14. Find out about the services provided by the University Archives. Return to the Home page (rating: 2).

*Observations.* Though three participants had slight problems finding the University Archives, only one had significant problems. Only two participants had problems finding the Simon Collection, one of the full-text collections of archives (some clues were provided in the task statement). Those having problems tried to access the collection from the “Libraries and Collection” page. This path is a little longer, providing more opportunity for error.

A greater concern might be that patrons will not be aware of the vast services offered by the archives and the University Archives because this department link is hidden on an interior page. To get to the University Archives users had to follow this path:

Libraries and Collections → Archives → University Archives.

Users also must be aware of the special collections housed on the site in order to find them or even know to look for them. For the tasks most went to the “Libraries and Collections” page and followed this path:

Libraries and Collections → Archives → University Archives → Simon Collection.

*Discussion and response.* Two problems were detected as a result of the tasks:

- (1) the University Archives and digital collections are not visible on the home page or on the pages as expected by the user; and
- (2) the path to the collections was difficult to follow.

To address these problems the following adjustments were made:

- The archival digital collections are now featured on the “Libraries and Collection” page in the right sidebar. The links’ labels are emphasized with a bold font and located the top of the right sidebar in a bucket labeled “Digital Collections”. The tasks indicated that this is the page where users expected to find the collections.
- To alert users to the new digital collections, some are featured in the buckets on the home page on a rotating basis.
- The “University Archives” link continues to be available from the “Libraries and Collections page”. Including a link to the University Archives on the home page will provide more visibility.

### **Comments and suggestions**

Following the protocols, participants were asked to comment on what they liked or disliked about the site, and if they had suggestions or comments. This section provided

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some insight into the reactions of the participants about elements not covered during the tasks: the following is a summary of these comments and suggestions.

*What did you like about the site?*

Many participants said they liked the redesigned site. They said that it was cleaner, clearer, more organized, appeared user-friendly, headings are bolder, and color is better:

The site is well-organized. It looks better than the old one.

It's not as busy as the other page was. It's a little more user friendly, has a photograph, Cameo at the top, which is good.

I think the site is very clear, it's simple; it doesn't look complicated.

I like the bold headings, the general headings that pulled me in.

I like the colors better. The last time the colors were green and this time they're like the university colors.

Links to services are more obvious (e.g. "Ask a Librarian" and course-related research:

The services are more obvious. More links to course related research/books is a good idea.

I really like the Ask a Librarian. Depending on how fast they can get back to you, I think that's very valuable, when I'm at home, I really think that's great.

*What do you dislike about the site?*

Some links are still not obvious e.g. header links and the library catalog (Cameo) link:

The one thing that I would change is that I really didn't notice what's on top in the banner. It would be something to highlight, but they did blend in.

Some had problems with usability and design of the Cameo interface (e.g. the back button, Cameo website page design):

There's something wrong with the Back button in Cameo.

The Cameo website page, the search page is not user-friendly at all.

Cameo is probably what 90 percent of users use, and the interface is pretty ugly.

Some felt that the buckets were cluttered and difficult to scan:

Maybe the right side with the links and What's New, maybe something could be done about that ... this looks a little bit cluttered.

It's hard to go through the buckets. Generally I would ignore most of the minor parts if it's not in the main part here.

## Conclusions

Though no major problems were detected using the think-aloud protocols, some weaknesses surfaced that led to design changes and increased the usability of the site.

The protocols also provided some insight into how users navigate the site and what they consider priorities in the design. Major findings include the following:

- Users navigate from top to bottom and left to right. Color and graphics attract their attention. They expect to find conventional links in the header, e.g. site map and logo, but do not look to the header for links unique to the site.
- Font size, color, labels using common terminology, location, and spacing increase the visibility of important links such as Cameo, online assistance, and user services.
- Chunking information in sidebar buckets, placing keywords and links at the beginning of the text, and limiting descriptive text improves the visibility of the links or keywords in the bucket enabling quick scanning.
- Consistency in the form of global design, header, footer, and labeling decreases the learning curve for users and increases the usability of the site. This also increases usability for returning users, that is, once they learn to navigate the site, remembering the location is easier.
- A global header is useful in providing users with a sense of place, that is, where they are and how to get home, and is important to navigation.

Though the procedure was lengthy, used a number of different methods and involved a diverse group of people including library personnel, students and a design team, the results were worthwhile. The iterative process of user feedback, design, and user testing was necessary to provide user-centered services via the website. Currently, the Libraries are working on consistency in design and re-labeling on the interior pages. User testing will be useful on problem areas.

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Please fill in the circle beside the response that best describes you or your use of the Website site.

1. What is your affiliation with Carnegie Mellon University?
  - ☐ Undergraduate Student
  - ☐ Graduate Student
  - ☐ Faculty Member
  - ☐ Staff
  - ☐ Alumnus
  - ☐ Visitor
  - ☐ Other \_\_\_\_\_
2. How did you find out about the site? Mark all that apply.
  - ☐ Carnegie Mellon home page
  - ☐ Library workstation
  - ☐ Search Engine
  - ☐ Faculty member
  - ☐ Library staff member
  - ☐ Friend
  - ☐ Other \_\_\_\_\_
3. In the last six months, **approximately** how frequently have you visited the Library Website site?
  - ☐ Daily
  - ☐ Weekly
  - ☐ Monthly
  - ☐ Less than once a month
  - ☐ Never
4. What browser do you **usually** use? Mark all that apply.
  - ☐ Internet Explorer
  - ☐ Netscape
  - ☐ Opera
  - ☐ Other \_\_\_\_\_

Please rate the following by circling a rating from 1 to 5 with 5 as the highest rating. Circle NA for Not Applicable or Don't Know.

I use the Library Website site . . .	Frequency of Use					NA	
	Very Often				Almost Never		
5. For accessing library catalogs, databases, reference materials, full-text books, journals, newspapers, etc.	5	4	3	2	1	0	
6. For general information about services: reference, borrowing, reserves, Interlibrary Loan, etc.	5	4	3	2	1	0	
7. For libraries' hours, job opportunities, copyright information, What's New, etc.	5	4	3	2	1	0	
8. For information about staff, archives, the Carnegie Mellon Libraries, Oakland Library Consortium, etc.	5	4	3	2	1	0	
9. The vocabulary used on the Website site is	Very Clear				Confusing		NA
	5	4	3	2	1	0	
10. The information offered on the Website site is	5	4	3	2	1	0	
11. How useful is the Website site is for your research?	Very Useful				Not Useful		NA
	5	4	3	2	1	0	
12. How useful is "Search This Site", the option to search for things that are available on the site.	5	4	3	2	1	0	
13. Librarian assistance on the Website site is	5	4	3	2	1	0	
14. The visual appeal of the Website site is	Excellent				Poor		NA
	5	4	3	2	1	0	
15. Links to outside information are	5	4	3	2	1	0	

**Figure A1.**  
Website user survey

Tasks	To determine if ...
1. Describe the first item you notice on the page. What do you notice next, and next? Participants 1, 2, 3 9 only	... major items are easily recognized
2. Using the mouse, show which elements on this page are actionable or clickable. Participants 1, 2, 3 9 only	... the links on the page in the navigation bar and the footer, within the page and in the buckets are recognized
3. Find out if the library has the book <i>The Art of Digital Photography</i> by Tom Ang. Return to the home page	... participants can find and use the online library catalog and return to the "home" page
4. Find additional resources and help relating to a project you're working on for an Architecture class without using the library's catalog or the databases.	... participants are aware of additional resources and the reference librarian available in their content field in "Research Help". Are participants aware of the information in the buckets?
5. Can you find help for the specific course titled "American Built Environment since 1860"? Return to the home page.	...
6. Find online help to develop search terms from a librarian? Return to the home page	... participants find and recognize the objective of the link "Find a Librarian". If participants fail to complete Item 4, then try optional. This item will observe if participants can find the link
7. Check your account to find out about such things as overdue books, books on hold, or to the change PIN? Return to the home page	... participants can find and use the personal account services available on the website
8. Find a tutorial offered on the website. Return to the home page	... usability of buckets
9. Find a page in the site for dictionaries, encyclopedias, etc. Return to the home page	... participants can find and use the Virtual Reference Shelf (or other reference materials) in the virtual reference shelf. Desired action: General/Reference Shelf → Almanacs, Dictionaries ... Back or Home
10. The Libraries' Website site has full-text collections of archival materials. Some highlight the achievements of notable individuals. Find the Herbert A. Simon Collection. Return to the home page	... participants can find the special online collections and return Home
11. You would like to borrow a book that is held by another library and have it delivered to one of Carnegie Mellon's libraries. Show me what you would you do in this site to borrow this book? Return to the home page	... participants are aware of the services provided by Interlibrary Loan
12. Find the database NetLibrary. Return to the home page	... participants can find the databases. Desired action: Databases by Name → N → NetLibrary Back → Home
13. Find an overview of what is included in the site. Return to the home page	... participants can find the Site Map
14. Find out about the archival collections and what services the University Archives provide. Return to the Home page	... participants can find the University Archives and the services provided by archives
15. Using this website, how would you log on to the University of Pittsburgh's library catalog?	... participants are can find the links to other library's catalogs

**Table AI.**  
Think-aloud protocols:  
tasks